TAB A

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The instant invention concerns an automatic belt tensioner with a base member and regarding base member a common rotational axis relative against each other rotatable clamping part, whereby that is base member or clamping part with a clamping arm the connected, with the base member or the clamping part connected friction cone, on the friction cone mounting and around the axis of the friction cone a rotatable, axial slotted feather/spring socket and the feather/spring socket and the friction cone surrounding coil spring, whose is end at the base member and their other end at the clamping part a secured, and with an axial slotted, between the feather/spring socket and the coil spring located bolting socket, which transfers a bolting strength of the coil spring to the feather/spring socket.

Such belt tensioners are from the German patent application No. DP-A-40 10 928,3 known. Such predominantly in the automotive manufacture used belt tensioner serve for it, a constant belt tension for example between a pulley fixed at a driven shaft of the engine and the pulley of a Zusatzaggregats, like an alternator to obtain circumferential drive belt. With to small belt tension a slip of the belt on the pulleys arises with Drehzahländerungen, whereby a disturbing quietschendes noise becomes caused. A too small belt tension leads also to a belt flutter and thus to premature wear of the belt. A to a large extent constant belt tension becomes set by means of a belt tensioner, which exhibits a tension adjuster role mounted at a clamp arm biased with a spring force. With large Drehzahländerungen, as for example with the starting the engine, however further the problem of short term fluctuations of the belt tension arises, since with the spring force to oscillations bends applied belt tensioners.

It is therefore an object of the instant invention to create an improved automatic belt tensioner.

This object becomes with a belt tensioner that initially mentioned type disengaged, roughened with which the outer surface of the friction cone is at least in portions.

By the graining of the friction cone a frictional force between the feather/spring socket becomes, becomes transmitted on which over the bolting socket the bolting strength of the coil spring, and which friction cone increased. Therefore the swinging ability of the clamp arm is against base member the damped, whereby a belt flutter and a vibration response of the belt tensioner become also reduced with abrupt Drehzahländerungen.

In a favourable embodiment the friction cone in one is essentially the bolting socket opposite region on roughened. Since in that the bolting socket opposite region of the friction cone becomes the bolting strength of the spring due to the bolting socket particularly effective transmitted, a graining of the friction cone in this region leads to a particularly effective increase of the frictional force and therefore to a particularly effective attenuation of the vibration response of the belt tensioner.

A roughness depth R of graining between 2 and 25 mu m proved in accordance with the accomplished experiments as particularly favorable, whereby the best value became with a roughness depth R of 24 mu m achieved.

Other favourable embodiments come out from the Unteransprüchen.

In the accompanying drawing an embodiment of the belt tensioner according to invention is shown, on the basis which the instant invention is to become more near explained and described.

In the drawing a base member of the belt tensioner with the reference numeral 1 and a clamping part with the reference numeral is 2 referred. Clamping part 2 is 10 connected with a clamping arm, at which a belt which can be stretched against one is put onable impeller 11 present. Clamping part 2 is more rotatable against base member the 1 around an axis 22 by a guide pin 4 supported fixed at the base member 1. The guide pin 4 is cast in in the present example into a recess 16 of the base member 1, in order to be received a fixed connection with the base member. A corresponding formed guide pin could become however also into the recess 16 pressed. It would be more other possible to provide the guide pin with a thread to bolt and with an appropriate in the recess of the base member 1 formed threads.

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The guide pin 4 is in, in the drawing overhead region with a plain bearing 7 surrounded. The plain bearing consists in the present case of a Metaloplast flanged bush. Clamping part 2 exhibits itself ganzstückig thereby a connected, with a central, axial recess provided friction cone 9, its outside circumference conical toward to the base member tapered, and its inner diameter in the vicinity of the base member approximate constant and of the guide pin 4 spaced and subsequent region axial in that (in the drawing overhead region) in contact with the outer surface of the plain bearing is. The friction cone 9 9 wound are within an annular recess 17 of the base member 1.Eine into coil spring 5 convenient by the annular recess 17 of the base member and a corresponding, this opposite recess 18 of the clamping part 2 formed annular cavity are partial around the friction cone. Between the coil spring 5 and the friction cone 9 is a feather/spring socket 3 inserted provided with an axial slot. The two ends of the coil spring 5 are distant in axial direction, whereby them in each case into an appropriate recess in the base member 1 and the clamping part 2 (in the drawing not visible) engage.

Between the feather/spring socket 3 and the coil spring 5 a likewise axial slotted bolting socket 8 is because of the base-lateral end of the coil spring. At the outside circumference of the bolting socket 8 support themselves approx. two turns of the coil spring 5 off, against what in that the axial region subsequent on the bolting socket the other turns of the coil spring 5 to the feather/spring socket 3 are and the friction cone 9 spaced. Only the last turn of the coil spring 5 at the side of the clamping part 2 rests upon supports 18 formed on the friction cone 9. The outside diameter of the friction cone 9 increases with the distance of the base member 1. The corresponding form of the friction cone possesses also the feather/spring socket 3 a conical tapered form.

In an outside edge area of the base member 1 a groove is 13 formed, into which a stop boss 12 formed at the clamping part 2 rises up.

At the free, the anchored end opposite end of the guide pin 4 fixed in the base member a caulking hub is 14 formed with reduced diameter, which through-rises up by a central recess of a locking washer 6. The axial projecting portion of the caulking hub 14 is flanged over the locking washer 6.

The outside cladding region of the friction cone 9, which becomes 8 covered of the bolting socket, exhibits a graining 20. The depth of the graining 20, which represents an averaged roughness depth in accordance with DIN 3141, amounts to in the present example 24.1 mu M. Graining can exhibit a general roughness depth within the range of 5 to 25 mu m.

In the present example that is base member 1 and clamping part 2 from aluminum pressure pouring made. The feather/spring socket 4 can preferably consist of a plastic material, which contains a lubricant. The bolting socket, itself over approximately 40% of the length of the axial part of the feather/spring socket extended, is for example made from aluminium. In operational case is by spring 5 clamping part 2 around rotational axis 22 against base member 1 biased, so that the clamping arms connected with the clamping part 2 on a belt, against which the impeller 11 of the clamping arm 10 lies close, a biasing force exercises 10. The bias of spring is so selected that the biasing force is also still sufficient large if the belt adjusts itself in runnings of the service life extended, and the clamping arm 10 accordingly bottom twist of the clamping part 2 and bottom reduction of the spring tension. The spring 5 twisted by the bias exercises a radial pressing force on the underlying bolting socket 8. This pressing force becomes of the bolting socket 8 on the feather/spring socket 3 transmitted. Since both the feather/spring socket 3 and the bolting socket are 8 axial slotted, the inward acting bolting strength of the spring can become over the entire inner peripheral region of the bolting socket on the feather/spring socket transmitted. This at the bolting socket and/or. the feather/spring socket arising force 9 received become by the friction cone, so that between the friction cone 9 and the feather/spring socket 3 in the region of the bolting socket 8 a frictional force extending around the whole circumference arises. The frictional force is increased by the graining of the friction cone in that the axial extent of the bolting socket respective region. Thus a substantial more effective attenuation of the belt tensioner oscillationable due to the action of the coil spring becomes achieved.

In the subsequent shown table the amplitude values of an oscillation of the belt tensioner are with various Betriebssitutation and for various roughness depths of graining gesture of in the line 1 are to the comparison the measurement values with not roughened surface of the friction cone shown. In the columns 1 to 4 are the amplitudes in mm of the excursions of the impeller for the operating situation with 730 revolutions/minute (column 1), with 1000 revolutions/minute (column 2), when starting and/or. Turn off the engine (column 3) and when strangling the engine in the second gear (gaps 4) shown.

Table

Vibration amplitudes in response of the roughen up-deep
EMI6.1

How is to be inferred from the gained measurement data, a slight improvement becomes both with 700 revolutions/minute and with 1000 revolutions/minute compared with an embodiment without graining of the friction cone achieved by the graining of the friction cone with normal operating conditions, with which no large abrupt change of the revolution number arises. The reduction of the amplitude values for an embodiment of the friction cone with a graining of 24,1 mu m roughness depth compared with a friction cone without graining are about 700 revolutions/minute with 4%, and with 1000 revolutions/minute with 12%. A substantial stronger function improvement becomes by the graining of the friction cone with extreme conditions, like a starting and/or. Turns off the engine and when strangling in 2. Gear achieved. There the reduction in the vibration amplitudes amounts to 27% when starting and/or. Turn off and 60% when strangling in 2. Gear with the comparison one with a roughness depth of 24,1 mu m of roughened friction cone with a friction cone without graining.

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Additional one to the improved function behavior by reduction of the vibration amplitudes the effected graining according to invention of the friction cone an increase of the life of the feather/spring socket. An other advantage of the instant invention lies in the fact that the attenuation becomes to a large extent constant held over the entire life of the belt tensioner. While with on roughened friction cone of the belt tensioner a relative large difference between the static friction coefficient and the sliding friction coefficient for the frictional force acting between feather/spring socket and friction cone does not arise, which to a large oscillation excursion with the transition from detention to sliding friction leads, this difference between Haft-und is sliding friction coefficient by graining according to invention reduced.

The graining according to invention of the friction cone of the clamping part can be manufactured to relative simple by a processing with a grinding device. The measured roughness depths amount to for an abrasive with a granulation of K 150 22.5 mu m, of K 240 24.1 mu m and by K 400 13.6 mu M. The graining of the friction cone made in the present embodiment by means of a rotary grinding device, disposed with which blattförmiges sharpening material with that proceeding granulations mentioned was fan-like around a rotary axis. Graining leaves itself however also on other manner, z. B. implement by manual processing with sandpaper.

In the present embodiment became the experimental in the table listed measurement values at a belt tensioner with from aluminum pressure pouring made friction cone measured. Also experiments with other materials, like steel and copper, became than friction conical surface executed, became obtained with which similar improvements and advantages.

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